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SOVIET ACTIVITIES IN THE ARCTIC AND ANTARCTIC (4)

[Comment: Soviet Activities in the Arctic and Antarctic is a bimonthly report presenting information extracted from Soviet newspapers, periodicals, and books. This report includes information published up to 24 May 1956.

The report covers all Soviet activities in the Arctic and Antarctic with the exception of commercial shipping, which appears in the Summary series Transportation, Communications, Electric Power, and Construction in the USSR.

All temperatures in this report are given in degrees centigrade. Numbers in parentheses refer to appended sources.]

ARCTIC

Drift Stations

With the arrival of March, the Soviet drift stations completed another year of operation -- the first for Severnyy Polyus-5 and the second for Severnyy Polyus-4. In keeping with established policy, the Main Administration of the Northern Sea Route prepared an aerial expedition to deliver relief personnel to the drift stations at the end of March.(1) Two Polar Aviation aircraft left Moscow on 20 March to carry out preliminary work for the expedition.(2)

The new chief of Severnyy Polyus-4 is A. Dralkin, who took over the station when it was located at 87-25 N and 181-38 E (3), while the new staff at Severnyy Polyus-5 is commanded by Sokolov of the Arctic Institute.(2) Part of the replacement staff for Severnyy Polyus-4, including Aerologists Korolev, Fedorov, and Kortich, Dr Babin, and Radio Technician Sidorov, left Moscow for the Arctic on 6 April aboard the Polar Aviation aircraft SSSR-N-422.(4)

It was reported on 21 March that the Severnyy Polyus-4 had drifted more than 2,200 kilometers during its second year of drift and was then located at 86-32 N and 170-43 W. At the same time, it was reported that Severnyy Polyus-5 had drifted more than 2,300 kilometers and was located at 86-38 N and 94-32 E. (2)

In addition to replacing the personnel at the two existing drift stations, Glavsevmorput' (Main Administration of the Northern Sea Route) was also ready at the end of March to establish a third station -- Severnyy Polyus-6.

This station, operating under the direction of K. A. Sychev (5), was established to the north of the Bering Strait at about 80 N and 180 E, some 1,300 kilometers from the Arctic coast.(6) The expedition which established the new station was under the general direction of M. Ye. Ostrekin, and aerial supply was handled by I. S. Kotov and M. A. Titlov.(7)

The staff for Severnyy Polyus-6 left Leningrad on 30 March aboard the IL-12 aircraft N-438 piloted by Konstantin Fomich Mikhalenko. Polar workers from so-called "mobile detachments" who will conduct research at various points in the polar basin were also aboard the aircraft.(8)

The staff at the new station has been provided with the most modern scientific equipment available, including completely mechanized hydrologic gear.(6) On 6 April, Polar Aviation aircraft SSSR-N-477 left Moscow with a tractor for the station.(4)

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Aerial support for the drift stations was maintained during the past winter. On 28 February, I. P. Mazuruk took off from Moscow aboard the N-525 with cargo for the drift stations. On reaching Mys Chelyuskin during this flight (Moscow-Arkhangel'sk-Ostrov Dikson-Mys Chelyuskin-Drift Stations), Mazuruk marked a double ceremony -- the completion of 3 million kilometers' flying and the beginning of his 50th flight to the North Pole.

Mazuruk was accompanied on this flight by Copilot Gorbachev, Navigator Fesenko, Flight Engineer Gromov, and Radioman Kharitonovich.(9)

The flight of two MI-4 helicopters to Severnyy Polyus-4 and Severnyy Polyus-5 was reported in January. The aircraft were piloted by Afonin and Koloshenko and were expected to make the 7,500-kilometer flight in 8-10 days.(10)

In addition to the manned drift stations, the USSR has made wide use of automatic drifting meteorological stations. Dozens of these radio beacons have been placed in the Central Arctic Basin, most of them so-called "Alekseyev beacons," named after their designer, Yu. K. Alekseyev, senior scientific worker of the Arctic Institute.

Using these beacons and shore radio direction finder stations, workers at the Arctic Institute are able to maintain a rather complete picture of the ice drift over a great expanse of the polar basin.

Yu. K. Alekseyev has recently developed an entirely new type of automatic drift station which will operate for a year without maintenance. This equipment is readily portable, weighing only 200 kilograms, and is fitted with automatic gear for measuring air temperature, atmospheric pressure, and wind speed and direction. Meteorological instruments and a radio receiver-transmitter are mounted on a special chassis, while the operating machinery and power supply are suspended in the water below the ice in a hermetically sealed cylinder.

The automatic beacon transmits information four times daily, a clock mechanism turning on the transmitter. A selective signal may also be made from a shore station or passing aircraft which will put the transmitter into operation.

The first model of the automatic drift meteorological station has passed detailed tests and in the near future will be sent to the drift station Severnyy Polyus-4.(11)

Helicopter Flight to the Drift Stations

(Note: This item is the conclusion of an account which began in 00-W-31766.)

On the flight from the mainland to Severnyy Polyus-3, the helicopter piloted by Babenko was accompanied by an LI-2 and an AN-2.

On arrival at the camp, the duties of the helicopter crew were outlined. They included the establishment of an emergency base with equipment and supplies on a neighboring ice floe. The helicopter would also be used to carry out ice reconnaissance around the base and to transport hydrologists to areas away from the camp where they might pursue their studies.

During the summer, the crew worked and lived in tents, but with the approach of autumn low air temperatures compelled everyone to move into huts and to don heavy coats, gloves, and hats. The heavy gloves made it extremely difficult to work on the helicopter even during routine inspections, and in 40-degrees-below-zero cold the time for rotor bushing replacement was near. To replace this part, the rotor and several other assemblies had to be removed -- all this to be done in the open, in the midst of a purga, by the light of torches, with the thermometer reading minus 47 degrees. It took 2 days to complete changing of the bushing.

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It might well seem that better weather should have been awaited before undertaking such a difficult task, but the crew of the helicopter was always exactly punctual in carrying out such prescribed maintenance in order to keep the helicopter in complete readiness for any emergency.

Such a situation was not long in arriving. With dropping air temperatures ice motion and hummocking were heard all around the camp. On 24 November, the camp area itself was split by a crack through the ice field, and within minutes was divided in two by a strip of water 5 meters wide. The meteorological and hydrophysical huts were on the far side of the crack, as were the helicopter pre-heaters. In 45 minutes the helicopter was in the air and over the portion of the camp which had broken off.

Within 2 days, the crack was covered with young ice and the two parts of the camp were again united.

Flying by night, the helicopter could depend only on radio communications. Trips of up to 200 kilometers from the camp were flown and radio communications were always excellent.

On 1 December a new emergency arose as numerous cracks began to form in the camp's floe and the entire ice field began to disintegrate. This time it was decided to move the camp to a new location and the helicopter was used to trans-fer personnel, equipment, and supplies

On 20 April 1955, the drifting station Severnyy Polyus-3 was closed and all members of the expedition were returned to the mainland.

Arctic Institute Scientific Meeting

A scientific meeting has been held in the Arctic Scientific Research In-stitute of Glavsevmorput to discuss the results of recent Soviet polar research.

In addressing the meeting, V. Frolov, director of the institute, stated that polar workers had carried out a broad program of work on the Arctic in co-operation with 120 scientific research institutions. Thousands of polar workers have taken part in numerous expeditions into the Central Polar Basin, including aerial forays and operation of the drifting stations.

The drifting stations Severnyy Polyus-3, Severnyy Polyus-4, and Severnyy Polyus-5 have completed over 15,000 different meteorological observations, 2,500 ocean depth soundings, about 80,000 measurements of current speed and direction and 20,000 measurements of sea water temperature.

The Arctic Institute carries out hydrologic survey of the arctic seas every year, including the valuable oceanographic expedition made aboard the icebreaker Litke.

In the past 5 years, the personnel of the Arctic Institute have completed more than 250 scientific works, including 64 in the fields of oceanography, hydrol-ogy, and ice forecasting. In the works of the Arctic Institute and in the peri-odical Problemy Arktiki, 188 works have been published. The work of Prof G. Van-gengeym on a new method for long-range forecasting in the Arctic is of particular interest. Material from the high-latitude expeditions and drifting stations has resulted in an expansion of knowledge on natural processes in the Central Arctic.

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Considerable attention has been accorded work devoted to breaking up fast ice with the aim of achieving an earlier opening of navigation on the Northern Sea Route. This year it is planned to publish scientific works from the stations Severnyy Polyus-3 Severnyy Polyus-4.

In his address to the conference, A. Laktionov (chief of the Division of Oceanography, Arctic Institute) stated that the main task of oceanography during the past 5 years has been research on hydrologic and ice regimes in the polar seas and the central part of the Arctic Ocean. A total of 14 complex oceanographic expeditions were employed in pursuit of this work.

A complex expedition aboard the icebreaker Litke (Captain, V. Patashnikov) under the direction of L. Balakshin carried out research in the high-latitude areas of the Arctic Ocean. The ship passed to the north of Zemlya Frantsa-Iosifa and Spitsbergen (for the first time from east to west) and reached a record latitude (83-11 N) for free navigation. The members of the expedition took 57 complex oceanographic stations, completed 159 plankton collections, and made 27 trawls for bottom fauna. The expedition gathered a great deal of information on hydrologic conditions in the Arctic, with special interest shown in the sounding of 5,449 meters north of Spitsbergen -- apparently the greatest in the Central Arctic.

The study of currents is particularly important in studying arctic hydrology and ice movement. This work was pursued by oceanographic expeditions using new, complex instruments developed in the Arctic Institute.

Utilizing material from high-latitude aerial expeditions and from the drifting stations, Soviet scientists have worked out a number of factors relative to the oceanography of the Polar Basin. In the work Vodnyye Massy Tsentral'nogo Polyarnogo Basseyna (Water Masses of the Central Polar Basin), Candidate of Geographical Sciences A. Treshnikov discusses the distribution of water masses of various origins, and describes the penetration of Pacific Ocean water into the central Arctic as far as the North Pole.

Polar scientists Ye. Gakkel', V. Saks, and N. Belov have studied the bottom relief and sediment and the geological history of the central part of the Arctic Ocean.

Because of the work done by aerial expeditions, marine expeditions, and the drifting stations, enough material on Arctic Ocean bottom relief has been gathered to permit the construction of new bathymetric charts of the Central Arctic.

As major navigational aids, a number of works have been prepared for publication and many of them are already in distribution. These include the Vodnyy Kadastr SSSR po Arkticheskim Moryam (Water Cadaster of the USSR for Arctic Seas), Morskiye Gidrologicheskiye Yezegodniki (Marine Hydrologic Yearbooks), Ledovyye Yezhegodniki (Ice Yearbooks), and Gidrologicheskiy Atlas Sovetskikh Arkticheskikh Morey (Hydrologic Atlas of Soviet Arctic Seas).

Candidate of Historical Science M. Belov spoke to the meeting on the work Istoriya Otkrytiyai Osvoyeniya Severnogo Morskogo Puti (History of the Opening and Development of the Northern Sea Route).

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Candidate of Geographical Science G. Agranat spoke on new techniques being used by foreign countries in research and development of northern areas. He presented interesting material on foreign icebreaker fleets and transport ships for operating in arctic waters.

Other institute personnel spoke as follows: T. Santevich, on the work of Soviet scientists in ice and hydrologic forecasting; V. Antonov, on dynamic causes of fluctuations in ice cover in the arctic seas and the role of river currents; A. Nikol'skiy, on magnetic disturbances in the Arctic; V. Polyak, on aircraft navigation in the Arctic, using radio aids.

I. Peschanskiy, chief of the ice research laboratory at the institute, spoke on the use of modern techniques to combat ice and extend the season on the Northern Sea Route.

In the coming years, new expeditions will be sent into the Arctic. In addition to the Litke, scientists will use the Ob' for oceanographic survey of arctic seas. (13)

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Polar Station Personnel

The following personnel have been reported as part of the staff at the Ostrov Vrangelya Polar Station:

M. Morov, station chief

Kleymenov, radio technician

Lipochkin, mechanic

Balkin, senior meteorologist

Ivshin and Mal'kov, engineer-hydrologists

Pyzhova, meteorologist-aerologist (14)

Mining City of Inta

The mining city of Inta is undergoing rapid expansion and is becoming one of the major centers of the Pechora Coal Basin. In 1956, many new houses will be built there, in addition to a city library, movie theater, school, bakery, and other buildings.

[Photo No 213881 shows a street in Inta.] (15)

ANTARCTIC

Continued Soviet insistence on an "assigned sector" principle for purposes of IGY (International Geophysical Year) research is reflected in the following statement which was published in April 1956:

"At the Brussels IGY conference, the sector of Antarctica lying between 80 degrees and 105 degrees east longitude was assigned to the Soviet Union for scientific research." (16)

Antarctic Expedition -- Continental Component

The Soviet antarctic base camp Mirnyy was almost completed by mid-April and ready for winter. The camp contained 19 huts at that time, all of them heated by hot water circulated from electrically heated boilers.

A 600-kilowatt generator was put into operation at the camp on 23 March. (17)

The first Soviet ground expedition has been run through difficult weather conditions several hundred kilometers from Mirnyy in the direction of the south geomagnetic pole. At the final destination of this foray, the first intermediate base will be built between the main base Mirnyy and the interior base Vostok to be established near the geomagnetic pole.

Eleven men made the trip: Gusev, meteorologist; Sen'ko, geophysicist; Dolgushin and Vtyurin, glaciologists; Kapitsa, geomorphologist; Shchekin and Babarykin, aerologists; Malikov, radio operator; Komarov, mechanic; and Kudryashov, driver. The expedition was commanded by M. M. Somov.

The party left Mirnyy on 2 April aboard two Stalinets-80 tractors. The lead tractor pulled three large sledges, the first carrying a well-heated hut containing scientific instruments and an electric power plant. The other two sledges

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carried wooden huts, used as a company room and kitchen, and radiosonde equipment, supplies, and fuel -- wood and coal. The second tractor also towed three sledges, these loaded with drums of gasoline, kerosene, and solar oil.

As soon as the party left Mirnyy, scientific observations began. Together with data gathered during flights by Soviet aircraft and recent aerial photographs, information obtained by the party will be used for making up a map of the general area of the polar plateau.

At each major stop made by the party, glaciologists made broad right-angle cuts 2 meters deep to study ice structure.

The first stage of the party's trip (55 kilometers) followed the route taken by a Soviet cross-country vehicle during an experimental trip on 14 March. In the 20 days intervening between that trip and the later one, the snow cover had increased an average of 40 centimeters and in some places by as much as a meter.

Measurements of ice thickness made by Kapitsa using a portable seismo-acoustical installation show that at a distance of 4 kilometers from the ice edge, at an elevation of 200 meters above sea level, the ice sheet thickness is 600 meters. Here the ice is resting on the ocean bottom. At 20 kilometers from the coast, where the elevation is 840 meters, the ice sheet is [illegible]00 meters thick. The seismograms show a solid continental rock below this thick ice.

In addition to the regular meteorological observations carried out four times a day by Gusev, Aerologists Shchekin and Babarykin have made wind and temperature measurements in the upper atmospheric layers. The first radiosonde launched in the interior reached an altitude of 11 kilometers.

Geophysicist Sen'ko carried out astronomical observations and determinations of changes in the earth's magnetic field and magnetic variation.

According to April news reports, the party was continuing into the interior. At the 50th kilometer mark, the glaciologists set up the first pyramidal marker. These markers were set up throughout the trip at 50-kilometer intervals so that the movement of the ice sheet can be studied using aerial photographs. On 6 April, the party was nearing the 90-kilometer mark. Word from Somov indicated that the party had already covered 100 kilometers by 12 April.(18)

The continental component of the expedition has also made broad use of the aircraft they have available. Navigational difficulties in the Antarctic are being combated through the use of automatic radio direction finders and modern radar on all heavy aircraft. Pilots also have new charts made up for the expedition according to a system of so-called "conditional meridians." This system was first used by Akkuratov in 1937 for a flight from the North Pole to the Papanin camp on drifting ice.(16)

(Note: The original article, which is condensed above, also contains a description of the composition of these aerial charts. The system is essentially the grid-meridian system, in general use at present for polar flying, in which the polar axis is extended into infinity, thus producing parallel rather than converging meridians.)

The expedition's aircraft were used in January to carry out complex research on the so-called antarctic "oasis" located at 66-16 S and 100-45 E, about 400 kilometers east of Mirnyy. The following is a description of this expedition as written by A. M. Gusev:

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"Since it would be necessary to fly considerable quantities of supplies and equipment into the oasis and to use the helicopter for flights around the area, it was decided to build an auxiliary air strip on the way and provision it with spare fuel. This strip was built on the surface of the Shackleton Ice Shelf.

"In the evening of 22 January, the helicopter, and AN-2, and an LI-2 left Mirnyy for the auxiliary base. Aboard the aircraft, in addition to the crews under Sorokin, Kash, and Inozemtsev, were the first group of scientific workers from the detachments led by Korotkevich and Dolgushin, Meteorologist Rusin, Hydrophysicist-Meteorologist Gusev, Astronomists Kucherov and Zakopaylo, Geologist Voronov, Photographer Yeshurin, and Chief of the Air Detachment Cherevichnyy. Arriving at the auxiliary field at 2300 hours, the AN-2 was sent ahead to the oasis. When this aircraft sent back information about the area, the other aircraft and the helicopter proceeded from the auxiliary base. On the morning of the following day, all the aircraft were gathered at the edge of the oasis. We landed on the border of the mainland ice along the eastern edge of the Shackleton Ice Shelf, from where the oasis could be seen about 8 kilometers to the north-northwest.

"A camp location was chosen with the aid of the helicopter, and the first scientific group was transferred to the center of the oasis. The second scientific group, including Geologist Vyalov, Geomorphologist Markov, Glaciologists Avsyuk and Shumskiy, and Hydrobiologist Vinogradov, arrived in the camp 2 days later, delayed because high winds made flight impossible.

"When weather improved, a full research program was begun, including geological and geographical reconnaissance and glaciological studies. The meteorologists made round-the-clock observations, in addition to determining vertical temperature and moisture gradients in the ground air layer. Gusev and Vinogradov studied the water areas of the oasis.

"The observations of Vyalov, Markov, and Dolgushin, together with those of other expedition members, indicate that the oasis is a 15-kilometer strip of land and islands running along the edge of the mainland ice for a distance of about 50 kilometers.

"Morphologically, the oasis is basically of rough terrain with very complexly contoured depressions separated by elevations of various forms to a height of 200 meters. In the low areas, a number of depressions were noted partially filled with water. The elevations, mostly of rock, were surrounded with morainal deposits which also covered the bottom of intermediate and low areas. Even at the very tops of the elevations, glacial detritus was encountered.

"Throughout the territory of the oasis, very old rocks were found, basically gneiss with intrusions of granite. These same rocks were encountered in islands around the oasis and other regions where geologists and glaciologists were delivered for research by the helicopter. The geologists also established the presence of black cross dikes and veins of younger rocks, namely groups of ultra basalt [transliteration of Russian] and basalt. No sedimentary rock was found, but elements of them in the form of rose and lilac sandstone were encountered in detritus and moraine material.

"According to the observations of glaciologists Avsyuk and Shumskiy, the small glaciers of the oasis have risen as a result of accumulation of snow which falls in the autumn-winter period. The glaciers of the mainland ice mass flow around the oasis on all sides and intrude small tongues in several depressions along its edge.

"Research in the oasis on water features indicated several types: a large (several square kilometers) fresh lake, fed by water from the surrounding glaciers; and small ponds of 10-200 square meters, brackish or fresh depending on the source

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of melted snow and flow of the streams. In addition, a large pond was found with one side bordering the Shackleton Ice Shelf and the other side having the form of a fjord intruding into the side of the oasis. The water in this pond was salty, although there was apparently no connection with the sea. Marine organisms (including starfish, fish, and seals) found in this pond indicate that it is connected with the sea below the ice.

"In the large fresh-water lakes, depths measured up to 26 meters, and temperature of the water was around 4 degrees. Fresh water cyclops and filar algae were found in these lakes. Water samples were taken from various levels for chemical analysis. In the landlocked brackish ponds, nematodes and microscopic algae were found, and on the bottom of the small ponds these algae formed sapropelic sediment. In several ponds, the bottom sediment contained heavy concentrations of hydrogen sulfide. Water temperature in these small ponds was 9 degrees.

"According to the observations made by Korotkevich, plant and animal life in the oasis is extremely rich. He found representatives of coastal and snow Procellariformes in small quantities and several types of lichen and bryophytes.

"Meteorological observations executed by Rusin and Gusev indicate a sharp local climatic deviation in the oasis, characterized by a [positive] heat balance situation brought about by concentrated absorption of solar heat in the dark surface of the outcropping. The presence of the local climate is accentuated also by the extensive dimensions of the oasis. The observations executed, for example, indicate that each square centimeter of surface here receives about 700 calories [of solar heat], reflecting only 15 percent. On the ice surface surrounding the oasis, however, 76 percent of the radiation is reflected. As a result, the average daily air temperature in the oasis during these days reaches about plus 2 degrees while the surrounding area is about minus 2 degrees at the same time. The temperature of the surface layer in the oasis reaches plus 25 degrees by day, which brings about a rising air circulation and a heavy cloud formation. The presence of analogous formations in several directions along the horizon testifies to the existence of other oases, and their presence has been verified by aircraft reconnaissance.

"The heating influence of the oasis is felt on the neighboring glaciers, as a result of which significant ablation was observed in them. On the surface of these glaciers, many lakes, quite broad rivers, and streams were found. The strongest and most distant heat influence of the oasis is felt to the northwest, the heat being carried by the general air circulation which has a predominate southeast movement. In the area surrounding the oasis and at considerable distances from it, many separate outcroppings were observed which indicate that the oasis is in a state of growth.

"The expedition returned to Mirnyy on 30 January."(19)

[Photographs of the continental component of the expedition include the following: meteorological laboratory at Mirnyy (Photo No 213845); tractor moving aircraft across fast ice after unloading from expedition ship (213848); diver preparing for dive at unloading site (213844)(35); meteorological station at Mirnyy (213847); general view of Mirnyy on 13 February (213850); flag raising ceremony at Mirnyy on 13 February (213846); furniture delivered for use at Mirnyy (213849).(20)]

<u>Radio Communications Antarctic Expedition-USSR</u>

By the time the Antarctic expedition of the Academy of Sciences left the USSR in November 1955, the Glavsevmorput' radio center in Moscow had already made extensive preparations for maintaining communications with the scientific groups proceeding to the south polar regions. The radio center had never before maintained

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contact over such extensive distances, and the problem was compounded by the double season (summer in the Antarctic and winter in the USSR at the outset) and time-of-day difference which radio waves would encounter during transmissions.

To increase power and overcome these difficulties, the radio center installed directional antennas and other improvements. The radio station on the Ob' was also rebuilt to a considerable degree and the power of its transmitter increased.

At 1400 hours on 30 November 1955, radio operator Listov at the Glavsevmorput' radio center heard the call letters USDV for the first time -- this was the Ob' working. Since that time, the Glavsevmorput' radio center has been in contact with USDV night and day.

Radio echo occurred as the Ob' approached the equator, but this problem was met by shifting to a higher frequency. All messages transmitted from the USSR to the Ob' and Lena were routed through the Glavsevmorput' radio center.(21)

When the Soviet expedition arrived in Antarctica, the radio station ashore was one of the first installations to be made. By late March, I. Magnitskiy, radio detachment chief, and P. Tselishchev, radio receiving center chief, completed assembly of a high-speed apparatus which handles radiograms at the rate of 10,000-12,000 words per minute. This compares with a rate of 1,000-1,200 words per minute which can be handled by the best radio operator working by ear. (22)

At 1930 hours Moscow time on 9 April, direct radio-telephone communications were established for the first time between the radio center at Mirnyy and the Glavsevmorput' radio center in Moscow. This was a test of the radio-telephone equipment following completion of its installation. The radio-telephone system Moscow-Mirnyy will be maintained in regular operation without retransmission at intermediate points.(23)

A regular exchange of information between the Antarctic expedition and research workers in the Arctic is reported. The Antarctic expedition receives radiograms from polar workers at scientific observatories in Dikson and Tiksi, from polar workers at Mys Shmidta, and from personnel of the drifting stations in the Central Polar Basin.(24)

Antarctic Expedition -- Marine Component

Since leaving the continental camp at Mirnyy, the marine component of the Antarctic expedition aboard the Ob' has pursued a broad program of oceanographic research in south polar and adjacent waters.

A radio report sent from the Ob' in mid-March stated that it was following an irregular course along the coast of Antarctica with periodic forays into the open sea several hundred kilometers from the coast. During this time, the expedition discovered an unknown archipelago of three islands to the east of the Davis Sea. These islands were not noted on any of the ship's charts, so the expedition designated them the Ostrova 8 Marta.(25)

On 9 March, landings were made on these islands (lying off Wilkes Land near the Sabrina Coast) and interesting geological and biological collections were made.

On 14 March, the Ob' proceeded to the Banzare Coast in Wilkes Land to study the major area calving tabular bergs encountered in antarctic waters.

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By the end of March, the expedition completed its work in the area of Wilkes Land and was proceeding toward the Balleny Islands, past Adelie Coast and King George V Coast.(26)

From the Balleny Islands the Ob' sailed north toward Australia, passing Macquarie Island en route. The Australian government has maintained a polar station on this island for the past 8 years, and the station's chief, M. Adams, invited the Ob' to stop and visit the island. In response to this invitation, the Ob' anchored near the station while 11 members of the Soviet expedition, including Captain Man and V. G. Kort, went ashore.

The visit was returned on the following day when Mr Adams and two of his coworkers boarded the Ob' and inspected the laboratories and other facilities. Collections of rocks, fauna, and flora were sent to the Ob' from the Australian station.(27)

After reaching Australia, the Ob' turned south once more to conduct oceanographic profiles from the southern shores of Australia to antarctic waters. With the completion of this work, course was set for the Kerguelen Islands.

Radio communications were established with the French base on these islands while the Ob' was still some distance away, and meteorological information was exchanged. During the first radio-telephone conversation, Pasqual, the chief of the island, invited the Soviet expedition to visit Kerguelen.

The Ob' arrived at the islands on 20 May and dropped anchor while a large group of scientists and sailors went ashore to visit the French base. French personnel returned the visit to the Ob' on the next day.

At the end of May, the Ob' was once again at sea in the Indian Ocean to conduct oceanographic research from south to north.(28)

Antarctic Expedition Supply Ships

The Motor Vessel Semerka, refrigerator ship No 7, was tied up in Kaliningrad by mid-May after completing the trip Kaliningrad-Mirnyy-Slava Flotilla-Kaliningrad. The ship completed the 28,000-mile trip 49 days ahead of schedule.(29)

The Semerka was instrumental in returning three members of the Soviet Antarctic expedition to the USSR. The three, G. Avsyuk, K. Markov, and P. Shumskiy, were transported from Mirnyy to the whaling flotilla Slava aboard the refrigerator ship. The voyage from the Slava to Odessa was completed aboard the tanker Kherson.

The scientists arrived in Moscow by train from Odessa on 9 April.(30)

After leaving Mirnyy, the diesel-electric ship Lena proceeded to the Australian port of Adelaide, where it loaded cargo for Europe. It then sailed across the Indian Ocean, Red Sea, and Suez Canal, bunkering and taking on supplies in Port Said.

After unloading her cargo, the Lena will go to Leningrad and prepare for arctic navigation.(31)

Whaling Flotilla Slava

The Soviet whaling flotilla Slava arrived in Odessa on the afternoon of 13 May after completing its tenth antarctic voyage. On this trip, the flotilla returned with 18 million rubles in produce above the plan.

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This year, the Slava had a catch of 2,802 whales, from which the factory ship processed more than 26,000 tons of whale oil, over 2,000 tons of whale meal, and 600 tons of liver.

The Black Sea tankers Gor'kiy, Kherson, Kerch', and Leningrad and the Baltic refrigerator ship No 7 made voyages to the Slava in antarctic waters to transport fuel and provisions.(32)

The scientific group with the Slava flotilla, working under the direction of Candidate of Technical Sciences Aleksandr Kulikov, carried out regular scientific observations throughout the cruise. Regular weather reports were sent out from the Slava, and these proved to be of particular value to the Soviet Antarctic expedition since cyclonic disturbances begin in the region where the Slava operates and then move toward Mirnyy.(33)

Outline of Antarctic Climate

The following is an article on the climate of the Antarctic by G. M. Tauber. Tauber has conducted meteorological work in the south polar regions on several occasions while operating with the scientific group accompanying the whaling flotilla Slava.

"The basic characteristics of the climate of Antarctica are the short, very cold summer and the long severe winter. Air temperatures to the south of the 60th parallel almost always remain below zero in summer, and only in January, the warmest month in Antarctica, do they sometimes reach 2-3 degrees above zero.

"The Antarctic is colder than the Arctic. Comparative data from aerological soundings in these polar areas have established that, in the course of the entire year, the mean temperature of the troposphere in the Antarctic is notably lower than in the Arctic. In the summer, the Antarctic troposphere is colder than the Arctic by 5-10 degrees, while in the winter the spread of temperature decreases somewhat, although the temperature in the Antarctic remains below that of the Arctic. This is due in large degree to the character of the continental surface and its height above sea level, as well as to conditions of atmospheric circulation.

"The powerful ice cover of Antarctica is one of the main reasons for its cold and severe climate. This ice cover serves as a broad cooling surface for warmer air from the oceans on all sides. A steep temperature gradient is formed here which brings about the development of very intense atmospheric circulation in the Antarctic.

"Severe cyclones in almost uninterrupted progression move from west to east around Antarctica. These move at high speeds, causing bad weather conditions in antarctic waters and along the coast of Antarctica.

"Research on synoptic processes in the Antarctic, as completed by Tauber in the State Oceanographic Institute, indicates that the basic path of cyclones in the Antarctic corresponds closely to the edge of the floating sea ice. In the wintertime, when the ice edge is at its most northerly location, the cyclonic route lies along the 56th-58th parallel of southern latitude. (See Figure 1 appended.)

"In the second half of the summer and beginning of fall (February, March), the ice edge moves nearer to the shore of Antarctica, and therefore, the cyclonic track is displaced at the same time to its furthest point south. In connection with the increase of temperature contrast in the zone of the Antarctic Front during the approach of the ice edge to the mainland, cyclonic activity in the second half of the summer and attendant storms increase significantly. According to observations made from the whaling flotilla Slava in the Antarctic from 1947 through 1955, the number of days with storms in February and March was 35 percent greater than in December and January.

"In addition to cyclones formed on the Antarctic Front, large numbers of Polar Front cyclones are also encountered in the Antarctic. These are formed in the region between 30 and 40 degrees south latitude near the [illegible] shore of South America, South Africa, and Australia. As is apparent from Figure 1, these cyclones move in a southeasterly direction and after reaching the high southern latitudes mix with cyclones from the Antarctic Front. As a result of this mixing, deep subantarctic depressions are formed, which differ from the high latitude cyclones of the northern hemisphere by their high speed of movement. According to Soviet data, frequency of cyclones with a pressure below 985 millibars was about 92 percent in the Antarctic. For comparison purposes, it may be noted that such cyclones in North America do not exceed 4 percent and they are as rare in Europe.

As a result of this high frequency of severe cyclones in the Antarctic, a monthly mean pressure map carries the so-called Subantarctic Depression encircling Antarctica at a latitude of between 60 S and 65 S. (See Figure 2 appended.)

"To the south of the Subantarctic Depression, pressure increases over the continent where a polar anticyclone is located. The intense cooling of air over the ice sheet of Antarctica is undoubtedly of paramount importance in the formation of this anticyclone. It is believed that the center is located in the region of maximum freezing, over eastern Antarctica between 80 S and 85 S and 70 E and 100 E.

"There are at present several contradictory concepts on the regime of the anticyclone, but information available from meteorological and aerological observations in the central regions of Antarctica are insufficient for positive statements.

"Some details on the wind regime of the antarctic regions have been determined. Along the coast, winds depend on the pressure of the anticyclone over Antarctica and the regions of low pressure over the ocean. The prevailing winds there are easterly and southeasterly. Air which circulates for a considerable length of time in the antarctic anticyclone over the high polar plateau is intensely cooled and thus significantly differs in temperature and humidity from ocean air.

"Cooled air, flowing down from the high plateau of central Antarctica and arriving at the coastal periphery of the anticyclone, is influenced additionally by orographic conditions. These may cause the formation of local winds of storm and sometimes even hurricane force. At Denison Cape on the Adelie Coast, for example, the mean yearly wind speed during 2 years of observations was 19.4 meters per second. During the stormiest month, the average speed was 24.9 meters per second, and during the calmest month it was 11.7 meters per second. On 22 February 1951, a mean daily wind speed of 45 meters per second was observed there. The number of days with speeds in excess of 15 meters per second in the area was 340 per year. Wind direction was very regular, southerly and southeasterly winds amounting to 95 percent of the total.

"Winds flowing from the continent carry large quantities of snow to sea, which in the presence of low temperatures plays an important role in the formation of sea ice.

"Moving over the ocean, cold air from Antarctica reaches the area around the 60th parallel in summer, although by this time it differs by only 2-3 degrees from air moving in from warm northerly latitudes.

"The strong westerly winds in the zone between 40 S and 55 S also exert an influence on the climate of Antarctica. These winds are produced by the steep pressure gradient in the intermediate area between the Subantarctic Depression

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and the Marine Subtropical High. These winds reach high altitudes where their speed is increased in the free atmosphere. A belt of westerly winds surrounding Antarctica forms a wind circle or, as it has been called, a wind barrier. This is the result of the thermal field of Antarctica in which isotherms generally follow the parallels of latitude, and zonal circulation is therefore predominant. As a result, the flow of warm air from the tropics to the Antarctic and of cold air from the Antarctic to the tropical latitudes is difficult. There are actually two climatical types in the Antarctic. Antarctica is characterized by a sharply defined continental-type climate with low temperatures in summer and maintenance of snow cover throughout the year. The antarctic marine area has a maritime type climate, although distinguished here by very cold summer. The difference in temperature between these climatic regions is especially sharp in the summer months, when a large part of the ocean is free from ice cover.

"Permafrost is one of the distinguishing characteristics of climate in Antarctica. The warming influence of the ocean is felt in only a narrow strip along the coast and does not penetrate into the interior of the continent. Summer temperatures in the interior regions, which are high above sea level, remain low. The average temperature for the warmest months in the polar region is 25 degrees below zero. Amundsen observed a summer temperature of minus 40 degrees in this area. The lowest verified temperatures have been observed not in the polar region but in the interior regions of eastern Antarctica. This is apparently the cold pole of the southern hemisphere and perhaps of the world.

"At the Great Ice Barrier (78 S) in the Ross Sea, the mean January temperature (the warmest month of the year) is minus 4.4 degrees. On the most northerly part of the coast, the mean temperature for January varies from zero to minus 3 degrees, and on the warmest part of the coast (the western shore of Graham Land) the temperature reaches plus one to plus 3 degrees.

"Winter in Antarctica is not only long but extremely severe. Even on the coast, the mean temperature in July is minus 24 or minus 26 degrees, and it is surmised that the mean temperature of July in the region of the pole is minus 48 degrees.

"Because of the strong winds, snowstorms (which are observed not only on the coast but in the interior also) are characteristic of the Antarctica climate. In the winter months, snowstorms are of long duration (6 to 8 days) and produce heavy snow drifting. Some of these snowstorms arise suddenly, reach hurricane force in a short period, and as quickly may end. The friction of the snow flakes one against the other and on the ice surface during snowstorms produces considerable electrical energy. At Cape Denison this electrical energy reached such dimensions that an insulated lead connected with a metal wire on the roof of a hut brought in an electrical charge which produced a spark 12 millimeters in length.

"The erosive effect of the blowing snow during these snowstorms is also significant. At Cape Denison it was noted that light fibers of wooden crates were eroded 3 millimeters in a period of 2 weeks.

"In calm periods another interesting phenomenon is sometimes observed -- a snow tornado. The air revolves with a strong circular movement and develops enough lifting force to raise cases weighing as much as 200 kilograms and deposit them several dozen meters to the side. A tornado observed at Denison Cape was 120 meters high and had a diameter of 90 meters.

"The question of precipitation in Antarctica has been studied very little although it is an extremely important question, particularly in connection with the feeding of glaciers.

"It is known that the maximum quantity of precipitation falls in the coastal areas; this is largely the result of cyclonic activity moving over the ocean. Precipitation in Antarctica is almost exclusively in the form of snow.

"In antarctic marine areas, the temperature is not as low as on the continent, but summer is significantly colder than corresponding areas (or even higher latitudes) of the northern hemisphere. According to observations from the whaling flotilla Slava, the mean temperature of the warmest month in the area of 60 S was the same as the summer temperature in the area of the North Pole as observed by Papanin.

"Both periodic and irregular temperature fluctuations in these areas are very small as a result of the influence exerted by the ocean. Snowfall and fog are characteristic here, and cause poor visibility and consequent difficult navigation conditions in antarctic waters.

"High wind velocity and frequency of storms make severe weather conditions in the marine areas of the Antarctic and especially in the zone between 40 S and 55 S, where the highest percentage of storms is observed. In nine of its voyages to the Antarctic, the whaling flotilla Slava only twice has crossed the 40 degree latitudes during good weather."(34)

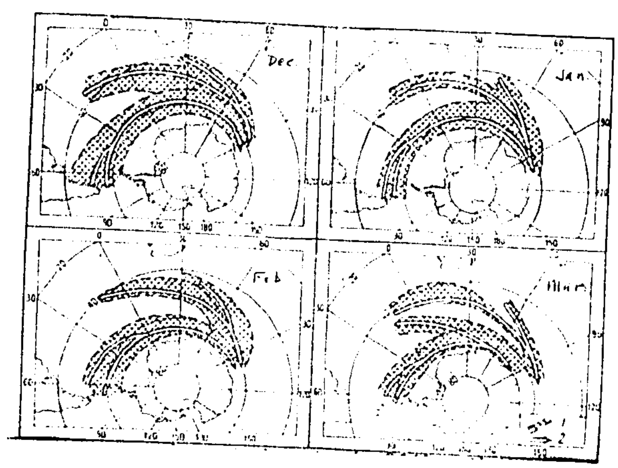

Fig. 1 Cyclonic tracks (1949-1953)

1 - zone of cyclonic influence
2 - cyclonic tracks

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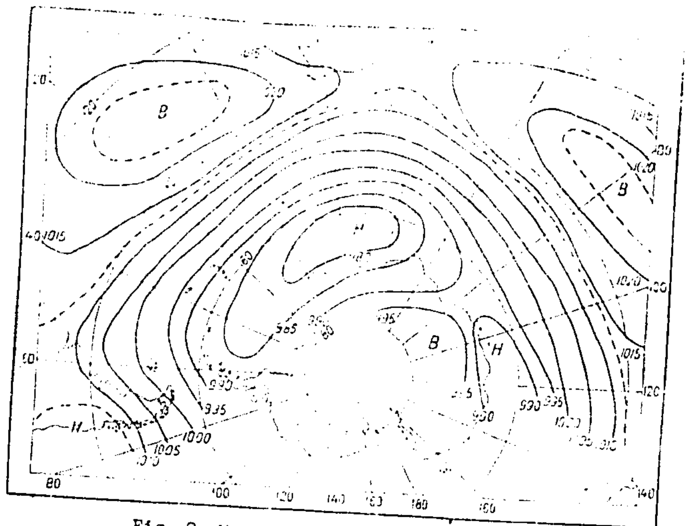

Fig. 2 Mean pressure at sea level.
Summer (Dec, Jan, Feb) 1950 and 1951

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